Sent By Electronic and U.S. Mail

February 27, 2003

OSWER Docket (MC 5305 - G)
U.S. Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, NW
Washington, DC 20460

Re: EPA Document Number: RCRA-2002-0033
"Draft Guidance For Evaluating The Vapor Intrusion to Indoor Air Pathway From Groundwater And Soils (Subsurface Vapor Intrusion Guidance)"

Dear Sir or Madam:

The American Chemistry Council is pleased to submit comments on EPA's "Draft Guidance For Evaluating The Vapor Intrusion to Indoor Air Pathway From Groundwater And Soils (Subsurface Vapor Intrusion Guidance)," herein referred to as "the guidance."

The American Chemistry Council (ACC) represents the leading companies engaged in the business of chemistry. Council members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. The Council is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $450 billion dollar enterprise and a key element of the nation's economy. It is the nation's largest exporter, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies invest more in research and development than any other business sector.

The American Chemistry Council (ACC) commends EPA for developing the Vapor Intrusion (VI) Guidance. We appreciate the flexibility that the Agency has displayed through its willingness to evaluate additional data and revise the guidance as needed. We support the document's tiered approach, allowing flexibility to enter and exit the process at any point - thus preventing the unnecessary expenditure of time and resources. Though we generally support the Agency's development of guidance for evaluating the VI pathway, we believe that certain parts of the guidance are overly prescriptive and/or overly conservative. Our comments on the document are both general (i.e., focused on overarching policies or issues) and specific (i.e., dealing with specific sections of the guidance document). Our general comments below are subdivided into areas of support

and areas of concern. We appreciate this opportunity to comment on the guidance, and we look forward to working closely with the Agency on additional issues in the future.

General Comments

We commend EPA on the general approach taken in developing this guidance, but we would have hoped for greater stakeholder participation in developing the final proposal. ACC is supportive of the guidance on the following points:

- The guidance is a tiered approach allowing flexibility to enter and exit at the appropriate tier (based on the availability of site-specific data), thus potentially optimizing time and resources throughout the process. Although fully supportive of the need for site-specific evaluations, ACC would caution the Agency against making the early screens so stringent that more sites than necessary are forced into time and resource intensive site-specific evaluations.

- The guidance recognizes that the Occupational Health and Safety Administration (OSHA) has the lead role in addressing occupational exposures and that OSHA standards should apply at occupational settings. ACC supports the Agency's recognition of this regulatory scheme.

- ACC supports the ability of the risk manager to use a range of acceptable risk levels to make decisions, selecting a media specific target concentration at the 10^{-4}, 10^{-5}, or 10^{-6} cancer risk level. ACC recommends that the guidance include a reference to EPA's Risk Assessment Guide for Superfund (RAGS), which provides advice on how best to make choices between the use of population risk versus individual risk, and among appropriate risk levels on a site-specific basis.

- The guidance recognizes that background ambient (outdoor) and indoor air emission sources must be considered when evaluating the indoor air pathway. ACC strongly supports the EPA on this decision. This is a critical issue since the number of background indoor air sources can be considerable and often at levels above the derived health targets. ACC recommends that EPA adjust the health protective standards to include a "floor" value (similar to MCLs for groundwater) for constituents with reliable background indoor air concentrations.

- ACC supports the flexibility in the guidance which allows the use of models for evaluating the vapor intrusion pathway for the purpose of determining whether a site meets the environmental indicators (EIs).

- The guidance excludes Subtitle I underground storage tank (UST) sites. ACC supports this decision since this pathway has been addressed by various state guidance documents for UST sites. However, EPA should ensure that there is

consistency in addressing constituents (e.g., benzene, tolulene, ethylbenzene, xylene) from one program to another.

- EPA is willing to evaluate additional data and revise the guidance accordingly. ACC strongly supports this provision. ACC strongly believes that field experience will show how best to revise the guidance to make it more effective while still being health protective.

Although ACC commends EPA for its effort, ACC has several considerable concerns and believes that the guidance should be revised to be more effective as follows:

- ACC believes that EPA has incorrectly identified the chemicals to be considered in this evaluation (Table 1). EPA's RAGS Part B Guidance defines volatile chemicals as those "having both a Henry's Law constant of $1x10^{-5}$ or greater" and " a molecular weight of less than 200 grams per mole." The VI guidance uses only the first of these criteria to identify volatile constituents. This is inconsistent with current EPA guidance on defining volatile chemicals, and will be a source of confusion for state regulators and the regulated community.

  Recommendation: Constituents included in Table I should meet the criteria for defining volatile chemicals in EPA's RAGS Part B Guidance.

- ACC strongly believes that the Vapor Intrusion Database has been improperly evaluated by EPA, resulting in the selection of overly conservative attenuation factors. Further, ACC contends that the EPA Vapor Intrusion Database and other available data (e.g., radon data) indicate that less conservative attenuation factors would provide protective groundwater and subslab screening concentrations.

  Recommendation: EPA should re-evaluate the database and propose more appropriate attenuation factors. ACC is willing to provide assistance to EPA in demonstrating that less conservative screening limits would be appropriate for petroleum and chlorinated compounds.

- ACC believes that the field evidence cited in the guidance and the Vapor Intrusion Database are not sufficient to justify the requirement that the VI pathway be evaluated if a building is within 100 feet vertical distance from contamination. A review of the EPA's vapor intrusion database indicates no cases of vapor intrusion reported at sites with dissolved constituents in groundwater at a depth-to-groundwater of greater than 30 feet.

  Recommendation: EPA should develop a more appropriate screening distance. ACC is willing to assist EPA with developing appropriate screening distance criteria for the vapor pathway evaluation.

- ACC believes that the proposed sampling and analysis method for groundwater has not been tested or shown to be more effective than traditional monitoring well placement and sampling. Further, the guidance recommends discrete interval ground water sampling that limits the use of existing site characterization information.

  Recommendation: We recommend that the guidance allow for traditional monitoring well placement and sampling methods. EPA should eliminate the requirement for discrete interval groundwater sampling. ACC is willing to work with EPA to develop consensus guidelines that best use existing site characterization data.

- ACC believes that the guidance lacks the flexibility to evaluate pathways in a source area. For example, if no unsafe vapors are found above a LNAPL area, then no evaluation of the dissolved plume should be required.

  Recommendation: The sampling guidelines should be streamlined to allow site investigation data to demonstrate that a pathway is incomplete and, therefore, the site does not require an additional extensive study.

- As a practical matter, ACC believes the document is overly complex and cumbersome to use. The forms and tables included in the text of the guidance are overly prescriptive and limit flexibility of the user to provide the information in other, already-existing formats. The user should not be required to recreate or reformat already-existing data, but should be permitted to document the VI pathway evaluation in an alternative format. Further, while providing relevant information and resources, the appendices also place too much emphasis on very detailed and complex analyses.

  Recommendation: The format of the document should be simplified and made more flexible. The question and answer format should be moved from the main text of the guidance and included in an Appendix as an illustrative example for documenting a pathway evaluation. The guidance should make clear that alternative formats for documenting the VI pathway evaluation are acceptable. In addition, the appendices should be streamlined and defer to more authoritative guidance or methods (e.g., the SW-846 Analytical Methods and Testing) where applicable.

Specific Comments by Guidance Document Section

I. Introduction

Section B. Intent – We believe that EPA could clarify the intent of the guidance by stating that the intent is to focus on necessary actions for a site rather than dictating responses for an individual building or risk assessment.

Section C. Applicability - The indoor air concentrations of petroleum hydrocarbons in the EPA Vapor Intrusion Database are all within the range of background indoor air concentrations reported in the literature. In addition, the indoor air concentrations are not correlated with groundwater concentrations. These data indicate that dissolved petroleum hydrocarbons do not cause measurable indoor air impacts. Based on these data, all biodegradable petroleum compounds, rather than just those from petroleum USTs, should be excluded.

III. Summary of Draft Guidance

We strongly support the use of a tiered approach for the evaluation of the VI pathway. However, the document should more clearly acknowledge that alternate technically-defensible approaches can and may be used to evaluate the pathway. We believe that the inclusion of the question-and-answer format in the main body of the guidance implies that this format is the only means by which the VI pathway may be evaluated. A more flexible approach would be to include the form only as an example in an appendix rather than in the main body of the guidance. We also support including (and would be willing to provide input on) a more simplified format than the one provided.

IV. Use of this Guidance

Section A. In section A**,** EPA defines volatile chemicals as those with a Henry's Law constant of $1x10^{-5}$ or greater (RAGS Part B is cited as support for this definition). In fact, RAGS Part B defines volatile chemicals as those "having both a Henry's Law constant of $1x10^{-5}$ or greater" and "a molecular weight of less than 200 grams per mole." It is unclear why this guidance has eliminated the second criterion set out in the cited reference. This omission results in an inconsistency between the screening levels applied for the indoor air pathway and for other potential exposure pathways at RCRA and CERCLA sites.

EPA Regions III and IX rely on both criteria in defining volatile chemicals for purposes of developing Risk-Based Concentrations (RBCs) and Preliminary Remediation Goals (PRGs), measures that are commonly used to define site assessment requirements and to carry out health risk screening at CERCLA and RCRA sites.

The guidance's use of a 100 ft vertical depth criterion for requiring a VI pathway evaluation is overly conservative. A review of the EPA Vapor Intrusion Database shows no cases of vapor intrusion reported at sites with dissolved constituents in groundwater

greater than 30 feet in depth. In addition, various state vapor intrusion guides indicate that the 100 ft vertical distance criterion is overly conservative. For example, Pennsylvania's vapor guidance (PA Document Number 253-0300-100) applies the 100 ft vertical criterion only to NAPL. If NAPL is not present, then the criterion for a sandy vadose zone is 30 ft. For other soil types, the criterion is less than 30 ft.

Tier 1 – Primary Screening

Question 1. We suggest that Table 1 in Tier 1 simply list volatile chemicals that should be considered in an evaluation of vapor intrusion. Chemicals not considered volatile could be listed in a separate table in an appendix along with the rationale for why they are not included in Table 1, if desired.

Data Needs: The evaluator is asked several times to determine whether the data are adequate. This issue should be addressed in the beginning of the process and should not require subsequent evaluation.

We believe existing data, particularly for Environmental Indicator (EI) CA725, should be utilized as extensively as possible. Thus, we suggest that test methods valid on the date of data acquisition be accepted here, and that EPA refrain from imposing current guidance retroactively.

Question 2. Density gradients have the potential to influence vapor migration only at extremely high vapor concentrations ($> 1 \times 10^7$ $\mu g/m^3$; Falta et al., 1989). The discussion of "vapor clouds" should acknowledge this limitation on density-driven flow.

Question 3. It would be appropriate to include a question in the primary screening tier to evaluate whether a pathway is incomplete based on engineering controls. Two possible examples are a vapor barrier preventing vapor intrusion, or an industrial control room that is over-pressurized.

Tier 2 – Secondary Screening

A question regarding adequate characterization of the nature and extent should be asked at the beginning of the process, not multiple times during the secondary screening evaluation. We note that a response of "no" to this "adequate characterization" question would lead to a recommendation of "expeditious" collection of needed data. However, if the preliminary data indicates no unacceptable risks, it is unclear that a quick response is necessary. Also, a single question regarding precluding factors should be asked at the beginning of the process, not on multiple lines during the secondary screening.

The criteria that preclude the use of screening concentrations seem arbitrary (especially the depth to groundwater criterion). These precluding factors are not supported by available data except for the case where groundwater impacted by NAPL is directly intruding into a building. The 5-ft to groundwater criterion is too prescriptive, and should

be replaced with a more generic criterion such as, "very moist or saturated soils at the slab/foundation depth." Also, the precluding criteria for the <15 ft groundwater conditions need to be reconsidered. We do not believe that the field data support the use of such prescriptive criteria that preclude the use of screening concentrations.

The guidance itself seems to preclude the use of screening tables when a "preferential pathway" exists. We disagree with this; in fact, sites with a naturally-occurring preferential pathway have been included in the EPA vapor intrusion database used to develop the screening concentrations. As an alternative, the guidance should require evaluation of preferential flow pathways, but not preclude the use of the screening concentrations.

The text question 3 on page 28 of the guidance suggests that either subslab data or soil gas data collected from a depth >5 ft are expected to be of good quality, but soil gas data collected below a building from a depth of <5 ft are expected to be of poor quality. We contend that this is not supported by field data, and we recommend that it be removed from the guidance.

Questions Q4 and Q5 - The information required to complete the "site-specific" Q5 evaluation is very basic (soil type and depth to source). This information should be available at any site with enough data to complete any part of the Tier 2 screening. As a result, the more conservative Q4 screening does not offer any benefit to the user and should be removed from the guide. In addition, the guidance should be modified to reflect that Q4 and Q5 screening do not evaluate whether a pathway is complete or incomplete, but whether or not conditions of unacceptable risk exist.

The guidance suggests that Q4/Q5 model accommodates horizontal layers of soil types. While the VI model allows for the use of layers, the guidance does not appear to allow this.

Evaluation of the EPA Vapor Intrusion Database, accounting for indoor air background concentrations, supports a subslab to indoor air attenuation factor of 0.01 (rather than 0.1). The basis for an attenuation factor for samples collected from zero to five feet below the slab is not supported by the data presented and should be changed.

We question the basis for the default Q4 attenuation factors. The graph of attenuation factors versus groundwater concentration clearly indicates that background indoor air impacts significantly influence the measured attenuation factors. This seems to be the only explanation for why attenuation factors would decrease with increasing groundwater concentration. Elimination of data pairs with below average indoor air concentrations does not seem to eliminate or reduce the apparent impact of background on the attenuation factor distribution. As a result, the default attenuation factors selected for use in Q4 based on evaluation of this database were overly conservative. Also, reevaluation of the data supports an upper-bound attenuation factor of 0.0001 rather than 0.001.

Question Q4b – EPA needs to clarify that the chemicals of potential concern are only those compounds detected in the subsurface and their degradation products.

Question Q4c – It is unclear how leaking vapors from USTs and vapors released from dry cleaning facilities may enhance convective transport. It should be noted that density driven flow occurs only at extremely high vapor concentrations ($>1x10^7$ $\mu g/m^3$; Falta et al., 1989).

Questions Q5e and Q5f – The soil type, depth to source, and attenuation factor, as well as the representative concentrations and screening values should be documented when answering these questions (regardless of a "yes" or "no" answer).

Tier 3 – Site Specific Assessment

We believe that the introductory section under Tier 3 should include a discussion of biodegradation. Also, detailing what site-specific data should be collected to evaluate biodegradation would be appropriate here.

The section on site-specific assessment that EPA has provided should also make clear that alternative methods are permitted (or, alternatively, encouraged).

Question 6c - Because this guidance is not intended to be used to calculate risk, this question should be reworded to ask whether groundwater/soil gas concentrations are below modeled protective values

It is possible to collect building ventilation data and/or soil data to calculate a site-specific subslab attenuation factor. The guidance should be revised to clarify that this information can be used to develop a site-specific subslab attenuation factor, if it is available.

Question 6f - At all tiers, data adequacy should be addressed as the first step in the process.

Appendix B – EPA states that additional considerations should be made for sensitive populations, children, and chronic illness. Additional language should be added to clarify that the toxicity factors used to develop the risk-based exposure concentrations have already been adjusted to provide protection for sensitive populations. In most cases, additional modification of the toxicity factors would not be required.

Appendix D – EPA screens out chemicals by looking at the potential risk if the indoor air concentration was equal to the saturated vapor concentration. In Table 2, there is a minimum attenuation factor of 10 across the slab for all cases. We believe it would be appropriate to use the factor of 10 when screening out chemicals initially, since some will drop out immediately in Table 2. Further, ACC suggests that the indoor air targets in Table 2 include a consideration of background data, (i.e., for constituents with available background indoor air data, a "floor" value should be the limit). This would be similar to the use of MCLs as a "floor" for groundwater).

ACC requests that solubility values, Henry's Law coefficients, and maximum calculated vapor concentration values be included on Table 1 so that EPA's calculations can be reproduced.

Table D-1: EPA should delete chemicals that do not meet the criteria for volatility and toxicity. We note that some of the Toxicity Values listed in the table are designated as "withdrawn" by Regions III and IX. This designation should be noted in this table and the reasons for their withdrawal should be reviewed to determine whether they should still be used at all. Also, the inclusion of NCEA provisional values in the table should be reviewed. EPA Regions III and IX routinely use NCEA values, but there are some discrepancies between the values included in Table D-1 and those used by the regions. These discrepancies result in inconsistencies between screening levels used for the indoor air and other exposure pathways at the same site.

Appendix E: Relevant Methods and Techniques - Few protocols exist for sampling water table groundwater, soil gas, and indoor air. The protocols that do exist are generally poorly validated and often conflict with each other. ACC is willing to provide assistance to EPA on identifying appropriate methods and techniques.

Appendix E provides a number of recommendations for sampling that appear to be unsupported by field data. For example, the last paragraph of Page E-5 recommends duplicate samples be collected for **every** indoor air sampling location in order to assess laboratory variability. Available indoor air monitoring results do not seem to indicate that this level of redundancy is needed to characterize lab variability. EPA has existing QA/QC guidance, and we do not think that this should be changed for indoor air sampling.

Section III: Groundwater Sampling - In EPA's training session on this guidance, data presented for the Raymark site seemed to indicate that traditional monitoring well samples provided a better indication of the potential for vapor intrusion than samples collected right at the top of the water table. Nonetheless, Section 3 emphasizes "depth-discrete" groundwater sampling rather than use of available groundwater data from the existing site characterization study. Although the guidance makes reference to sampling available groundwater wells, we believe the guidance, as written, will push case managers to require that new groundwater monitoring points be installed, or at a minimum that new groundwater data be collected, using "depth-discrete" techniques.

Section IV: Indoor Air Sampling and Analysis - The procedures described in this section are detailed and require significant effort, including taking multiple, simultaneous samples for each sample location – a procedure that is not typically performed. Also, because of the overly conservative screening levels, equipment blanks and other quality control measures will be necessary to ensure reliable results at very low detection levels. We believe this level of detail is overly proscriptive and should be simplified.

The Agency should recommend the removal of potential background sources prior to conducting an indoor air survey when such removal is possible. However, it should be acknowledged that the effectiveness of these measures at reducing background indoor air concentrations has not been demonstrated. EPA needs to more carefully account for the effects of background sources when conducting these surveys.

Section V: Soil Gas – This section indicates that soil gas sampling at less than five feet below ground surface (bgs) should not be used because the results are not reliable. This and other recommendations should be removed from the guidance unless they can be supported by high-quality field data.

Measurement of VOCs in the Subslab Soil Gas - The guidance in this section does not seem to be based on a large number of sampling events or upon data that have been validated or peer reviewed. Also, there are no specific precautionary statements about damaging foundations, creating vapor migration pathways and access or liability concerns highlighted in this paragraph.

Appendix F

Groundwater to Indoor Air Attenuation Factor: The analysis conducted to develop the upper bound groundwater to indoor air attenuation factor does not appear to adequately account for background indoor air sources. Preliminary studies conducted by ACC member companies and their contractors indicate that 0.0001 (rather than 0.001) is a reasonable upper-bound attenuation factor. ACC would be willing to work with EPA to share the results of these studies with EPA.

Use of Henry's Law to Calculate Groundwater to Indoor Air Attenuation Factors: Because diffusion through air is about 10,000 times faster than diffusion through water, diffusion from bulk groundwater to the bottom of the capillary fringe should be the rate-limiting step for groundwater to indoor air vapor intrusion. Barber et al. (Factors Controlling the Concentration of Methane and other Volatiles in Groundwater and Soil Gas Around a Waste Site, Journal of Contaminant Hydrology, Vol. 5, pp 155-169.), report that Henry's Law should not be used to predict soil gas concentrations for volatile chemicals with H' >0.01. The inclusion of Henry's Law constant in calculation of groundwater to indoor air attenuation factors artificially increases the range of attenuation factors observed for a site.

Use of Maximum Indoor Air Concentrations in Database: Most of the indoor air concentrations in the database are maximum values from multiple measurements. In contrast, the risk-based exposure limits are intended to be average exposure concentration limits. The use of maximum indoor air concentrations results in a conservative bias in the attenuation factors that is not clearly documented in Appendix F. In addition, the magnitude of this conservative bias is difficult to assess without access to the full range of indoor air measurements for each site. We agree that the screening values must be

conservative, but the conservatism should be documented and should be quantified when possible.

Data Set Issues: We are concerned that only data from sites with strongly-suspected vapor intrusion problems (based on factors such as noted odors) will be collected. This will result in an additional conservative bias in the distribution of measured attenuation factors in the database. The magnitude of this conservative bias will be difficult to quantify. To attain more appropriate attenuation factors, ACC recommends that EPA broaden the database to include sites that may have soil and groundwater impacts, but have no known vapor intrusion problems.

Reliability Assessment: We do not believe that the reliability assessment does a good job of estimating the true false positive rate associated with the use of the screening tables at corrective action sites. For chemicals such as TCE and benzene, where the risk-based indoor air limit is below the typical background concentration and the groundwater limit is less than or equal to the MCL, all buildings with typical background indoor air concentrations will be classified as "correct positives" whether or not vapor intrusion is occurring. Because the screening tables are derived using upper-bound attenuation factors, it makes sense that some false positives will occur at sites with average or below average attenuation factors. However, in the reliability assessment presented, background indoor air impacts will likely result in many of these true "false positives" being classified as "correct positives."

Appendix F - Subslab to Indoor Air Attenuation Factor, page F-3: The analysis conducted to develop the upper bound subslab to indoor air attenuation factor does not adequately account for background indoor air sources. A more comprehensive analysis of available data supports an upper bound attenuation factor of 0.01 (rather than 0.1). ACC would be willing to work with EPA to share the results of these analyses.

Appendix G - Considerations for the Use of Johnson and Ettinger (J&E) Vapor Intrusion Model

The presence of NAPL does not preclude the use of the vapor intrusion model. In fact, the EPA J&E Spreadsheet guidance (Johnson, Paul C., Identification of Critical Parameters for the Johnson and Ettinger (1991) Vapor Intrusion Model, American Petroleum Institute, May 2002, Number 17) explicitly states that it can handle this condition; soil gas samples can be collected above the NAPL and an assessment made. In addition, large water table fluctuations should not preclude the use of the J&E model. The guidance states that the model will not work under this condition because the capillary fringe will now be contaminated. There are 2 problems with this: 1) if there was no floating product, the capillary fringe will be as contaminated as before (or very close), and 2) one can use the model with the distance from the foundation to the highest groundwater elevation. Moreover, varying flow should not preclude the use of the model, but this factor is not even considered by the model inputs. Varying concentrations can be handled the same way as a varying water table by using the highest value as an input. Even in cases where there is NAPL in the unsaturated zone (or it is suspected that there

may be NAPL), taking soil gas concentrations provides a starting point for running the model.

We note also that different building mixing heights are proposed for slab-on-grade versus basement scenarios. However, this does not seem to be incorporated in the guidance.

Table G-1 – In the first assumption, under "Field Evaluation", EPA states, "Most DNAPL sites with DNAPL below the water table defy easy characterization." Though this is correct, it has no bearing on characterizing the concentration in the upper part of the aquifer. In the "Field Evaluation" part of this table, the comments should pertain to the task at hand, which is evaluating potential for indoor air risk. If this comment is retained, EPA should qualify it by saying that the presence of DNAPL does not preclude the use of J&E's model, as long as the concentration in the upper part of the aquifer is understood.

Table G-2 – EPA states that the J&E model has low sensitivity to changes in porosity values and moderate to high sensitivity to changes in moisture content. These parameters, however, are not independent. If one has high sensitivity, the other should have high sensitivity (Johnson, Paul C., ibid).

Newer, airtight houses will also be more airtight underneath; however, based on the model used in this guidance, houses with low rates of intrusion will indicate higher potential risk levels.

Section 4: Use of J&E Model as a Site-Specific Model. EPA recommends the use of a calibrated model if a site does not meet all of the criteria for applying J&E Model. However, if one has a calibrated model (i.e., calibrated to indoor air concentrations), 1) there is no need to model the situation and 2) the model will likely be inaccurate because of background and in-home contaminant contributions to indoor air. To avoid taking indoor-air measurements, the guidance should suggest calibrating the model from one section in the unsaturated zone to another (e.g. from groundwater to sub-slab concentrations or other soil gas concentrations directly above the source). This approach eliminates the ambient indoor air problems and also produces a model that can be used in a predictive manner in another location that has the same soil/site characteristics (e.g. under houses that have not been sampled or for future development).

Appendix I - Unsupported Recommendations: This appendix provides recommendations for addressing background indoor air sources with little or no data available to indicate whether these recommendations would be effective. For example, there appears to be little data to indicate whether removal of suspected indoor air sources will significantly reduce background indoor air concentrations, or whether building materials or other non-removable sources are more significant contributors in many homes. Recommendations not supported by data should be removed from the guidance.

Thank you in advance for consideration of our comments. If you have any questions about our comments, please contact Bob Elam at (703) 741-5242.

Sincerely,

Kerry Kelly
Team Leader, Waste Issues

Bob Elam
Director, Regulatory/Technical Affairs

References:

Barber et al. (1990) Factors Controlling the Concentration of Methane and other Volatiles in Groundwater and Soil Gas Around a Waste Site, Journal of Contaminant Hydrology, Vol. 5, pp 155-169.

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Little, J.C., J.M. Daisey, and W.W. Nazaroff (1992) Transport of Subsurface Contaminants into Buildings: An Exposure Pathway for Volatile Organics. Env. Sci. Technol., 26(11):2058-2066.